

## Supplementary Table 1

In the Random Network, we increase the value of  $p$ , and show the discrimination of degree, 2-order degree, and 4-order degree, with the number of nodes  $n$  and initial connection edges  $d$  change over 27 cases.

			degree	2-order degree	4-order degree
n=5000	p=0.01	std	7.0474	362.56	9.60E+05
		alpha=0.9	0.4336	0.4546	0.4638
		alpha=0.92	0.523	0.5568	0.5628
	p=0.05	std	15.34	3845.3	2.43E+08
		alpha=0.9	0.087	0.0908	0.0916
		alpha=0.92	0.1704	0.1752	0.1762
	p=0.1	std	2.15E+01	10736	2.69E+09
		alpha=0.9	0.0144	0.0152	0.0152
		alpha=0.92	0.0482	0.0506	0.0506
n=7500	p=0.01	std	8.544	652.23	3.81E+06
		alpha=0.9	0.35173	0.3608	0.36733
		alpha=0.92	0.44813	0.47013	0.476
	p=0.05	std	19.021	7141.1	1.01E+09
		alpha=0.9	0.039733	0.037733	0.36733
		alpha=0.92	0.095867	0.098933	0.099733
	p=0.1	std	26.169	19649	1.11E+10
		alpha=0.9	0.0022667	0.0021333	0.0022667
		alpha=0.92	0.0164	0.0168	0.017067
n=9000	p=0.01	std	9.3855	859.99	7.22E+06
		alpha=0.9	0.31689	0.31689	0.32167
		alpha=0.92	0.39711	0.42244	0.42678
	p=0.05	std	20.674	9320.8	1.90E+09
		alpha=0.9	0.023	0.023	0.023444
		alpha=0.92	0.069444	0.069556	0.069889
	p=0.1	std	28.652	25827	2.10E+10
		alpha=0.9	0.0013333	0.0013333	0.0013333
		alpha=0.92	0.009	0.0091111	0.0092222